I. C. 7102 FEBRUARY 1940

UNITED STATES
DEPARTMENT OF THE INTERIOR
HAROLD L. ICKES, SECRETARY

BUREAU OF MINES
JOHN W. FINCH, DIRECTOR

INFORMATION CIRCULAR

THE CEMENT INDUSTRY OF LATIN AMERICA

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BY

OLIVER BOWLES AND R. B. MILLER

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

THE CEMENT INDUSTRY OF LATIN AMERICA[1]

By Oliver Bowles[2] and R. B. Miller[3]

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7102."

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INTRODUCTION

The various Latin American countries are undergoing a slow process of industrialization. The harvesting of one or two agricultural commodities or the mining of a few marketable minerals is being supplemented by development of an integrated industrial economy. In many countries, progress in this direction has not been rapid, but as it gains impetus an increasing market for cement is a natural consequence. This is evident from the fact that industrialization is linked with increasing transportation, and means of transportation are very poor in much of Latin America. Bridges, culverts, and concrete highways, now scattered sparingly throughout the vast land areas south of the United States, must multiply as the demands of industry increase and as a higher scale of living is attained. Eventually the South American countries will be linked by modern highways. Furthermore, the arid climate of many regions creates a demand for construction of dams and irrigation works, and a continent poor in coal reserves but with abundant water power inevitably must direct its energies toward the construction of hydroelectric power plants. Countries rich in raw materials but with few natural harbors have urgent need of massive concrete breakwaters and docks. The demand for concrete in houses will also grow. Standards of living are low, and perishable building materials are widely used. As living conditions improve cement will be used increasingly in home construction. Even in the field of simple and modest housing cement affords a means of creating low-priced verminproof and fireproof homes, for which the need is imperative under climatic conditions that prevail in this area of the world. Already many of the countries have undertaken extensive public works, and such programs are likely to increase. Assuming moderate industrial progress and stabilized governments the demand for cement in this great southern area promises substantial growth.

In the past Latin America has been one of the world's largest export markets for cement. Its dependence on outside sources created no special problems of supply until the World War period when ships were scarce, supplies inadequate, and prices abnormally high. This embarrassing situation was the incentive for establishment or extension of domestic cement industries in many countries, which in consequence have become increasingly independent of foreign supplies. Argentina, Brazil, Bolivia, Chile, Colombia, Uruguay, Cuba, and Mexico are virtually self-sufficient in cement with the following exceptions. The principal needs of these countries in white cement and other special varieties must be imported. Imports also are required to meet the market demands of outlying territories that are reached more easily from foreign than domestic sources. Moreover, imported cements invade various other regions in these countries where they can be delivered at prices more advantageous than domestic mills can quote. Demands for cement have increased to such an extent that even though local production has made large gains a substantial tonnage must be supplied by imports. Panama Canal records show that increasing quantities of cement are being transported to the west coast of South and Central America.

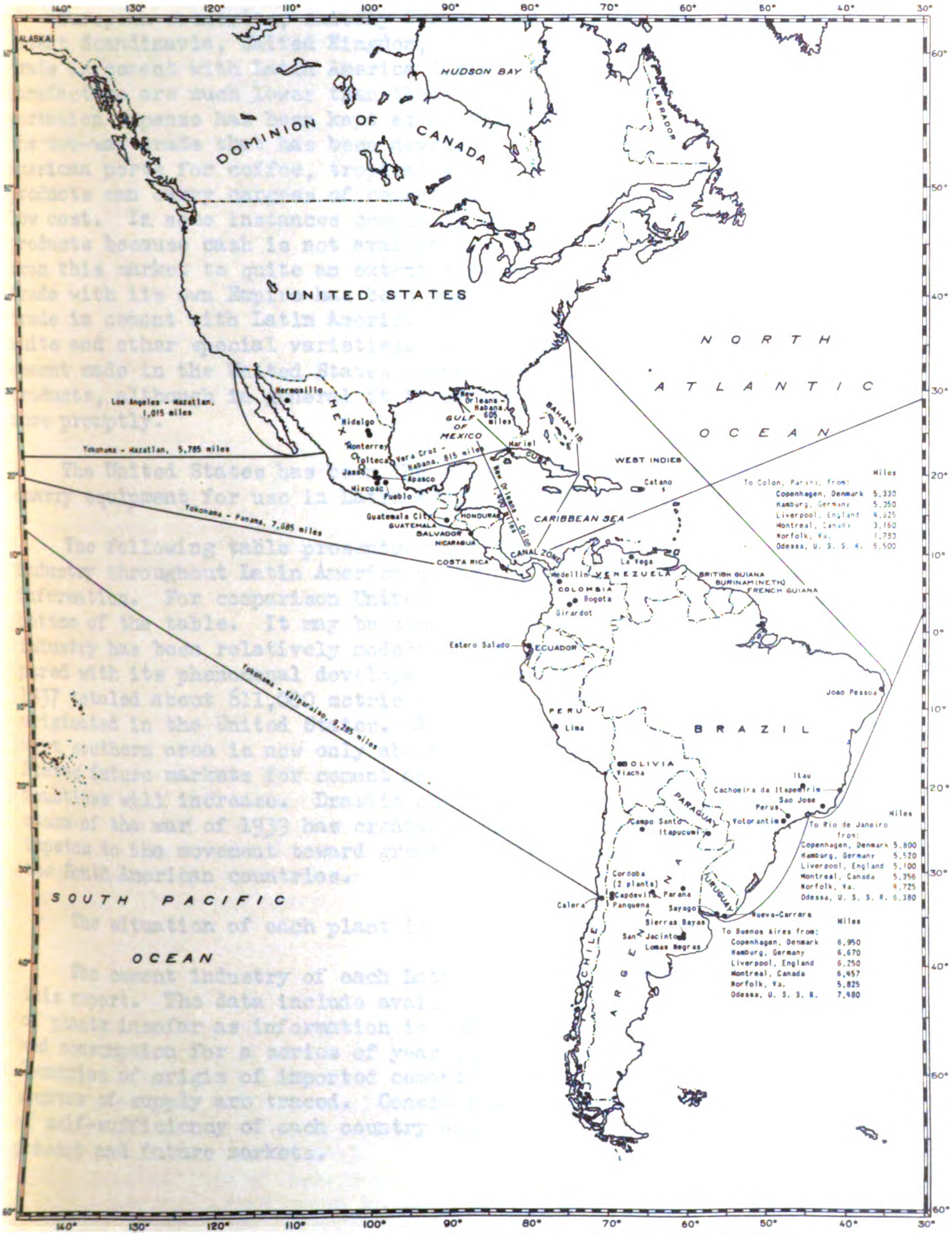

Figure 1.- Cement plants of Latin America. Distances in nautical miles by shortest navigable routes. (U. S. Hydrographic Office Pub. 117.)

European countries, chiefly Germany and Belgium, and to a smaller extent Scandinavia, United Kingdom, France, and Italy have dominated the trade in cement with Latin America during recent years. Their costs of manufacture are much lower than those in the United States, and transportation expense has been kept at a particularly low level because of the two-way trade that has been developed. Ships destined for Latin American ports for coffee, tropical woods, fruits, and other native products can carry cargoes of cement on their westward voyages at very low cost. In some instances cement is taken in exchange for South American products because cash is not available. Great Britain has withdrawn from this market to quite an extent because of low prices and because trade with its own Empire has been increasingly fostered. United States trade in cement with Latin America has been confined principally to white and other special varieties. In few places can ordinary portland cement made in the United States compete in price with the European products, although in general it is of better quality and can be delivered more promptly.

The United States has been the chief source of cement mill and quarry equipment for use in Latin America, with Germany ranking second.

The following table presents concisely the condition of the cement industry throughout Latin America according to the most recent available information. For comparison United States figures are added at the bottom of the table. It may be observed that the growth of the cement industry has been relatively modest in the Latin American countries compared with its phenomenal development in the United States. Imports in 1937 totaled about 611,000 metric tons, of which about 114,000 tons originated in the United States. As the per-capita consumption in this vast southern area is now only about one-fifth of what it is in the United States future markets for cement and cement mill and quarry machinery doubtless will increase. Drastic curtailment of imports from Europe because of the war of 1939 has created a situation that will lend new impetus to the movement toward greater self-sufficiency on the part of the South American countries.

The situation of each plant is shown in figure 1.

The cement industry of each Latin American country is covered in this report. The data include availability of raw materials, descriptions of plants insofar as information is available, plant capacity, production and consumption for a series of years, and per-capita consumption. Countries of origin of imported cement are recorded, and fluctuations in sources of supply are traced. Consideration is also given to the degree of self-sufficiency of each country and general conditions controlling present and future markets.

Salient statistics of the cement industry of Latin America[1]

Country	Plants oper-ating	Plants under con-struction	Production (metric tons)	Con-sumption (metric tons)	Per-capita consumption, bbl. (376 lb.)
Mexico	7	1	344,693	356,450	.11
Argentina	9	2	1,035,496	1,145,357	.53
Bolivia	1	0	61,841	63,993	.12
Brazil	6	0	571,452	646,283	.09
Chile	1	0	313,110	313,622	.40
Colombia	3	1	144,000	196,884	.13
Ecuador	1	0	13,674	2/ 23,000	.05
Paraguay	0	0	0	5,000	.03
Peru	1	0	101,707	143,205	.13
Uruguay	2	0	147,773	166,597	.47
Venezuela	1	0	44,626	164,126	.28
Central America	1	0	2/ 27,000	2/115,660	.09
West Indies	2	0	(3/)	290,000	.13
Total	35	4	4/2,805,372	3,630,177	.17
United States	151	2	17,857,119	18,219,204	.81

1/ Most of the data on production and consumption are for 1937, but in a few instances earlier or later figures are used.

2/ Estimated.

3/ Bureau of Mines not at liberty to publish.

4/ Excluding West Indies.

MEXICO

Limestone and clay are abundant in Mexico, and gypsum is available in several regions. Both coal and fuel oil are plentiful. The high interior plateau is the most important cement-consuming region, and it is the most inaccessible to foreign cements because it is protected by a series of topographic barriers. As a consequence freight rates from the coast are very high. Cement plants have been built wherever the market is extensive enough to warrant it.

The following companies operate in Mexico:

1. Cementos Mexicanos S. A., Monterrey. This company, established in 1931, was a consolidation of Cementos Monterrey S. A. with plant in Monterrey and Cementos Hidalgo S. A. with plant at Hidalgo, both in the State of Nueva Leon. The company was capitalized at 4,400,000 pesos ($2,073,852). About one-half of the stockholders are Mexicans and the remainder Americans, Spaniards, and British. In 1934 the Hidalgo plant which had been idle for several years was taken over by the laborers with the approval of the Government of the State of Nueva Leon. It was understood that the latter would assume responsibility for reimbursing the

owners for the plant, payments to extend over a period of years. The Government planned to send Mexican workmen to foreign countries to study cement manufacture in order that they might be better fitted to fill administrative and technical positions at the plant. It was reported in December 1937 that 400,000 pesos ($111,111) had been provided to finance reorganization and reconditioning of the plant, which had been idle for 10 years. Of this amount, 80,000 pesos was advanced by cement dealers and the remainder by the National Bank of Popular Credit. No recent data are available on the success of this enterprise. Evidently the State Government has taken no definite action.

In 1931, according to report, additional equipment was installed in the Monterrey plant for the manufacture of white cement ("Monterrey Blanco") at a maximum rate of 600 barrels a day. However, as late as 1935, construction of the new equipment was reported as still in progress.

2. Cemento Portland Nacional S. A., Hermosillo. Construction of the mill near Hermosillo (Sonora) was begun in 1930, and production was recorded in 1931. Both limestone and clay are obtained close at hand. The plant was built by a United States company, and all the machinery was made in the United States. It is a wet-process plant with an initial capacity of about 500 barrels a day. Oil is used for fuel. The original kiln was 150 by 8 feet. The plant has been described in the technical press.[4]

The demands for cement in the market area reached by this plant were quite limited in the early years of its existence. Accordingly plans were made to dismantle and remove it to Mazatlan (Sinaloa) where much better transportation facilities are available, but the company was unable to finance the move. The plant operated at only 15 percent of capacity in 1935 and was idle in 1936. However, the plant acquired a new lease on life in 1938 when construction of the Yaqui Dam was begun. This project has given the company an order for 300,000 barrels of low-heat cement. This is the first plant in Mexico to manufacture low-heat cement in quantity. Ordinary commercial demands for cement have also increased in this territory. The mill equipment has been reconditioned, and large cement storage silos have been added. New quarry development includes the opening of a large glory hole. Limestone and decomposed granite are the principal raw materials. Both United States and Mexican capital are involved in the enterprise.

3. Compañia de Cemento Portland S. A., Av. Independencia 8, Mexico D. F. This British concern has constituted an important element in the cement industry of Mexico. Its Tolteca and Jasso plants were the only units in operation in Mexico in 1922. The original plant operated by this company is at Tolteca (Hidalgo). An additional well-designed dry-process

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[4] Pit and Quarry, Portland Cement Plant in Sonora, Mexico, to Start Production in March: Vol. 21, No. 11, Feb. 13, 1931, pp. 20-22, 52.

plant began operation at Mixcoac (Mexico D. F.) in 1932. It has a 285-foot kiln, originally fired with fuel oil, and is equipped with Cottrell dust collectors and a Fuller-Kinyon conveying system. Limestone is obtained 40 miles distant and clay at the plant site. The plant has been described in some detail.[5] In 1934 the company introduced the use of mixed fuel, powdered coal, and oil, and the result is said to be highly satisfactory.

In 1932 the company also acquired the property of La Cruz Azul Compañia Manufacturera de Cemento Portland S. A. at Jasso (Hidalgo). As it was understood that the plant was to be shut down after its transfer, the workers, with financial assistance from the State, purchased it and operated it as a "Cooperative Society of Workmen." The State guaranteed payment of 1,312,000 pesos ($368,711), of which 20 percent was in cash and the remainder in 10 annual deferred payments bearing interest at 6 percent. According to report the new management was not entirely satisfactory.

4. "Cooperative Society of Workmen," Jasso (Hidalgo). The establishment of this organization is covered in the preceding paragraph. A new Compeb mill was added to the equipment in 1936.

5. Cementos Atoyac S. A., Puebla. This name has been used only since 1934. The original company, Compañia de Cemento Portland Landa S. A., began operation at Puebla (Puebla) in August 1921 and produced about 300 barrels daily. Both Mexican and United States capital was employed. New machinery, including an 8- by 125-foot kiln, was added in 1929. In 1931 one cement kiln was converted into a limekiln, and both caustic and hydrated lime was marketed. These were the first sales of hydrated lime reported in Mexico. A new railway was constructed in 1935 to connect the quarry with the mill. Two new tube mills and related equipment were added to the plant in 1936.

The company manufactures two special cements. "Atoyac," which is marketed in direct competition with portland cement, has, it is claimed, a higher strength than portland cement, a lower heat of hardening, and a greater bulk per unit weight. The second special type, "Plastocement," is used as a brick-laying mortar, for stucco, and as a rough and smooth hard-wall plaster. Both are patented products comprising a lime base, to which is added diatomite, silica, or clay. The mixture is ground in a tube mill with or without the addition of portland-cement clinker. Both types have been received favorably in the market and have been described in detail by Blank.[6]

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[5] Pit and Quarry, La Tolteca Erecting 1,200-Barrel-Capacity Cement Plant at Mexico City: Vol. 22, No. 7, July 1, 1931, pp. 50-52, 62.

[6] Blank, Alton J. Some New Cements - Their Manufacture and Their Special Uses: Rock Products, vol. 36, No. 8, Aug. 25, 1933, pp. 54-57.

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From 1928 to 1930 the company manufactured concrete railway ties, which were used on a 5 1/2-mile section of the railway from Puebla to Mexico City. According to report they gave satisfactory service.

Brief reference appears in the literature to a small plant at Puebla, known as Cimento Indio. A number of experimental installations failed, and the plant has evidently been abandoned.

All the plants now operating burn Mexican fuel oil, except the Monterrey plant, which uses some natural gas piped from Texas, and the Hermosillo plant, which uses California fuel oil. All are dry-process plants except the one at Hermosillo.

Cement is generally sold in cotton or jute bags, which may be paper-lined for shipments to damp, tropical regions. Although 15 or 20 centavos each is allowed at some plants for return of the sacks, often they are disposed of more advantageously to the poorer classes, who prize them highly for making garments.

Following is the estimated annual capacity, in metric tons, of Mexican cement mills, which are now operating at or near the places enumerated: Monterrey, 85,000; Hidalgo, 85,000; Hermosillo, 30,000; Tolteca, 100,000; Jasso, 84,000; Mixcoac, 60,000; and Puebla, 85,000 - a total of 529,000 tons, or slightly more than 3,000,000 barrels. According to the press,[1] production in 1930 was 1,250,000 barrels. In 1935 it reached 1,485,000 barrels; in 1936, 1,687,000 barrels; in 1937, 2,034,000 barrels; and in 1938, 2,205,000 barrels.

Of the seven plants recorded as active, one only, that at Hermosillo, is adjacent to the coast, and except for Government contracts its market is somewhat limited, being restricted to the sparsely settled States of Sonora, Sinaloa, and Baja California. The Monterrey and Hidalgo plants supply the markets of the northern half of Mexico, except the States mentioned above. The four plants in the neighborhood of Mexico City serve principally the populous interior plateau region, but they also ship to various points in the southern half of Mexico except Yucatan which is more accessible from New Orleans or other United States Gulf ports. The Pacific and Gulf coastal regions are not large users of cement, and evidently they are supplied to quite an extent from foreign sources.

It was estimated in 1938 that imports amounted to about 15 percent of consumption. About 12,000 barrels of white cement are imported annually, chiefly from the United States, for use in making tile and for white stucco facing of residences. Importation of cement is discouraged by a high tariff of 2 centavos per gross kilogram, or approximately $1.70 a barrel. To this must be added a surtax of 3 percent of the duty.

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[1] Pit and Quarry, The Cement Industry of Mexico: Vol. 23, No. 12, Mar. 9, 1932, pp. 39-42.

Retail prices vary widely depending on shipping costs. In general prices are high, and it is reported that the industry has been profitable. The Tolteca plant is said to have a sliding scale of prices, consumers near the plant paying more than those farther away.

The accompanying table shows imports, production, and consumption in Mexico during recent years. In this and most of the following tables consumption is assumed to equal production plus imports, because exports of cement from these countries are so small that they may be disregarded.

Imports, production, and consumption of cement in Mexico, 1935-38, in metric tons

Year	Imports from United States[1]	Total imports	Production	Consumption[2]	Per capita consumption, bbl. (376 lb.)
1935	12,735	-	251,651	-	-
1936	5,464	6,898	285,978	292,876	0.09
1937	3,671	11,757	344,693	356,450	.11
1938	3,972	13,883	373,729	387,612	.12

[1] Exports from the United States to Mexico.
[2] Production plus imports.

A moderate extension of the cement industry of Mexico is in prospect.

Cia de Cemento Portland Apasco S. A. was organized in 1930. Construction of a plant with German and Swedish machinery was begun in 1930 at Apasco close to the border of the Provinces of Hidalgo and Mexico, but work was suspended for several years. The company was reorganized in 1935 and, with federal assistance in the form of a loan of $250,000, undertook to complete the plant, but no report of production has yet been noted.

In 1937 plans were under way to establish a small cement plant at Ciudad Juarez (Chihuahua) not far from El Paso, Tex. Both limestone and clay are abundant in this region. The proposed plant would use gas for fuel and would have a capacity of about 250 barrels a day. No definite steps toward building the plant have been reported.

Consideration has been given to the establishment of cement plants in various other regions, but none of the plans has materialized.

SOUTH AMERICA

Argentina

The cement industry of Argentina dates from 1872, when N. Fuhr established the first Roman cement plant in Rosario (Cordoba).[8] This plant supplied only a small market and soon passed out of existence. In 1876 a plant built at Barraca Sal Sur (Buenos Aires) apparently made good cement for that time but evidently operated only a short period. In 1886 J. B. Masse built a plant "La Primera Argentina" in Valle de Cunillas near Cosquín (Córdoba). This plant also made hydraulic lime. After much difficulty a sizable market was developed. Nicolás Derossi in 1889 built a plant at Tandil (Buenos Aires) which made good cement for a few years but like its predecessors passed out of existence. In 1908 engineers E. Sanestrari and D. E. Gavier built at Rodríguez del Busto (Córdoba) a cement plant that was better organized and equipped than any of its predecessors. It produced only about 25,000 barrels a year and therefore supplied none but local demands.[9] Other needs were met by imports. This plant operated only a few years.

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[8] Magazine Geografico Argentino (Buenos Aires), La industria Argentina del cemento portland: Vol. 1, No. 6, December 1933, 31 pp.

The World War curtailed supplies, partly because shipping was diverted to the most essential military needs and partly because part of the labor normally working at cement plants was diverted to the manufacture of war supplies. Cement prices began to rise in 1916 and in 1918 were said to have been 348 percent higher than in 1913. The shortage of supply and excessive prices of this period led to the establishment of a domestic cement industry. Raw materials for such an industry were available in several important localities - limestone in Córdoba, San Juan, and San Luis; gypsum in San Luis, Rio Negro, and Entre Rios; and large clay deposits in Mendoza Province. No coal deposits of importance occur in Argentina, but domestic oil is available as a source of fuel for the kilns.

United States capital and management were responsible for erection of the first large plant. The Lone Star Cement Co. (International Cement Corporation) built a plant at Sierras Bayas in 1919. The company, known as Compañia Argentina de Cemento Portland, was capitalized at $3,000,000.[10] It is situated in a rich agricultural country about 200 kilometers south of Buenos Aires. The plant and two quarries occupy 320 acres comprising a supply of raw materials estimated by the company as adequate for making 115,000,000 barrels of cement, or enough to last 70 years. The mill is equipped with five kilns and has a capacity of 2,000,000 barrels a year. It cost $2,500,000, employs a maximum of 225 men, and has storage space for 60,000 barrels of cement. Oil from the Comodoro Rivadavia oil field is used for fuel. Warehouses are maintained at Avellaneda where bulk cement is repacked. The company has taken a particular interest in looking after the welfare of its employees, providing them with a townsite equipped with stores, church, and school.

The effect on prices of this new source of supply was felt immediately. From January to October 1919 prices fell from 247.50 to 79.95 pesos per ton.

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[9] García Mata, Carlos, El consumo de cemento portland en la Argentina: Revista Econ. Argentina (Buenos Aires), vol. 12, No. 134, August 1929, 24 pp.

[10] White, John W., Argentina's Cement Industry: Am. Weekly (Buenos Aires), vol. 2, No. 9, Aug. 30, 1924, pp. 5-7, 28-30.

The Compañía Argentina de Cemento Portland (Lone Star Cement Corporation) completed a new plant at Paraná, Province of Entre Rios, in 1938 at a reported cost of $2,430,000. Its location on the Paraná River, which affords water transportation for cement, is so advantageous that on several previous occasions steps were taken to establish a cement industry there, but each investigation of the possibilities proved that the lime content of the rock was too low and the silica too high to make a suitable raw material for cement manufacture. However, the introduction of a flotation process for purifying cement raw materials at Valley Forge, Pa., proved so successful that the new plant at Paraná was designed to employ it and thus make possible utilization of rock too impure for use without such treatment. The deposit of shell limestone, which is very extensive, was purchased in 1935, and after careful research and experimentation a plant of the most modern design was begun. Raw rock for the flotation plant is ground to a fineness of about 88 percent through a 100-mesh screen, which is just fine enough to break the physical bonds between the limestone and silica grains. By flotation the silica content of the rock is reduced from more than 30 to less than 4 percent. Proper adjustment in composition is made in slurry tanks, and the slurry is calcined in a 400-foot kiln. The mill has a capacity of 800,000 barrels a year, and the first shipment was made in February 1938. The plant has been described in detail in the technical press.[11]

Another important cement plant is that of Sud Americana de Cemento Portland, Juan Minetti e Hijos S. A., built at Dumesnil near Córdoba in 1930. It has two 230-foot kilns manufactured by the Polysius Corporation, Dessau, Germany. It is a wet-process plant equipped with the most modern devices, including slurry filters and waste-heat boilers. Oil is used as fuel. The quarry, which is about 1 kilometer from the plant, is in hard, crystalline limestone hand-sorted to separate undesirable magnesian beds. Clay, which constitutes 10 to 15 percent of the raw materials, is obtained about 4-1/2 kilometers from the plant. Both rock and clay are conveyed by aerial tramway. Situated at the edge of a city having a population of about a quarter of a million people, this plant has an excellent market for its product. During the first 5 years of operation it ran at maximum capacity. Robinson[12] has described the plant in some detail.

The company's new cement plant at Campo Santo, Province of Salta, was completed in 1939. It is a dry-process plant having one 8 1/2- by 260-foot kiln. The principal raw material is a porous limestone, which

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[11] Posselt, E., and Trauffer, W. E., Design of New South American Cement Plant Takes Full Advantage of Breerwood Process of Flotation: Pit and Quarry, vol. 31, No. 5, November 1938, pp. 40-56.
Rock Products, Argentine Cement Plant Uses Flotation Process: Vol. 41, No. 11, November 1938, pp. 24-33.

[12] Robinson, A. W., Demand for Cement Keeps Plant Running at Capacity for Five Years: Pit and Quarry, vol. 28, No. 6, December 1935, pp. 31-34, 38.

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is conveyed 9 kilometers to the plant over an aerial cableway of German manufacture. The mill equipment was purchased in the United States. Both clay and gypsum are obtained locally, and oil is used as fuel. The capacity is said to be 18 metric tons per hour, or roughly 145,000 tons per year. The plant has been described in detail by Newcomer.[13]

The company also operates a plant at Panquena near Mendoza (Province of Mendoza). Increasing demands for cement for road making and street paving encouraged the addition of a new unit, construction of which was begun in August 1938. The machinery was purchased in the United States at a reported cost of $237,000. The new unit comprises a 260-foot kiln, together with the necessary raw-grinding, clinker-cooling, and clinker-grinding equipment. Its capacity is about 200,000 metric tons of finished cement per year. It was completed and ready for operation late in 1939. This addition has been described by Wolff.[14]

Loma Negra S. A. built a wet-process plant near Lomas Negras, Province of Buenos Aires, in 1927. Its original capacity was 400 tons per day, but later it was enlarged.

Argentina has nine cement plants which are enumerated below, the Provinces being indicated in parentheses: Compañia Argentina de Cemento Portland, Subsidiary of Lone Star Cement Corporation, New York, N. Y., two plants, Sierras Bayes (Buenos Aires) and Paraná (Entre Rios); Loma Negra S. A., Lomas Negras (Buenos Aires); Calera Avellaneda S. A., San Jacinto (Buenos Aires); Sud Americana de Cemento Portland, Juan Minetti e Hijos S. A., three plants, Córdoba (Córdoba), Campo Santo (Salta), and Panquena (Mendoza); Corporación Cementera Argentina S. A., two plants, Córdoba (Córdoba) and Capdevila (Mendoza).

The capacity of the various plants is rated as follows in metric tons per year: Sierras Bayes 400,000, Paraná 135,000, Lomas Negras 450,000, San Jacinto 60,000, Córdoba 250,000 and 70,000, Panquena 300,000, Capdevila 46,000, and Campo Santo 145,000 - a total of about 1,856,000 metric tons or about 10,950,000 barrels. Production in 1937 was 6,109,000 barrels.

In 1938 the three plants in the Province of Buenos Aires contributed 68.5 percent of the total output.

Córdoba supplies that Province and the region northward to Bolivia, while the plants around Buenos Aires and in Mendoza supply the remainder of the country.

Two additional plants were under construction in 1939, one at Frias, Santiago del Estero Province, and one at Pipinas (Las Pipinas), Buenos

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[13] Newcomer, V. K., A New Dry-process Cement Plant in Argentina: Pit and Quarry, vol. 32, No. 1, July 1939, pp. 36-43.

[14] Wolff, Joseph M., Argentina Cement Plant Enlarged to Meet Heavy South American Demand: Pit and Quarry, vol. 32, No. 6, December 1939, pp. 30-33.

Aires Province. These two plants will have an aggregate capacity of 220,000 tons, making the total capacity for the country about 2,076,000 metric tons (12,250,000 barrels).

A shortage of cement was threatened in 1937 owing to an expanded Public Works program and activity of private building construction. This threat led to an intensive campaign for a reduction of import duties, but the situation was relieved by a strike in the building trades and a curtailment of Public Works. With completion of the plants now under construction it is believed that capacity will exceed the country's needs. The per-capita consumption of cement is higher in Argentina than in any other South American country.

It is claimed that there are no agreements between local producers as to territory, production, or prices. No special concessions are made to the domestic industries except that Government contracts frequently specify a preference for local cements.

The Cement Exporters Conference was organized in 1928 in Buenos Aires by European cement manufacturers. This conference allots sales quotas and maintains prices through controlled marketing. The conference originally comprised certain Belgian, German, and Swedish groups which were subsequently joined, it is said, by English and Argentine groups.

It has been claimed by some that Argentina has been the dumping ground for inferior European cements. According to report cement that had absorbed moisture during the long voyage was reground, packed, and sold under certain brand names. There has been some agitation for a law requiring analysis and approval of imported cement in accordance with official standards. American brands of cement are regarded highly, but imports from United States companies are small because of their inability to compete in price. The principal receiving ports for imported cement are Buenos Aires, Rosario, and Santa Fe. Exports are virtually negligible.

The following table shows the principal statistics of the cement industry of Argentina during recent years. In this table, as in those for countries discussed later, the imports from the United States and from the two leading European countries in 1937 are shown separately.

Imports, production, and consumption of cement in Argentina, 1935-38, in metric tons

Year	Imports from United States 1/	Imports from Sweden	Imports from Belgium	Total imports	Production	Consumption 2/	Per-capita consumption, bbl. (376 lb.)
1935	3,993	17,706	2,833	35,065	721,564	756,629	0.35
1936	4,497	11,858	3,625	27,646	833,631	861,277	.40
1937	4,920	25,015	38,048	109,862	1,035,495	1,145,357	.53
1938	6,132	(3/)	(3/)	74,931	(3/)	(3/)	-

1/ Exports from the United States to Argentina. 2/ Production plus imports. 3/ Data not available.

Bolivia

Bolivia is an isolated, mountainous country. About 80 percent of the population are Indians who have a very low purchasing power, which has been reduced further as a result of the Chaco War. The country has no concrete roads, and most of its buildings are made of adobe brick covered with plaster. Hence the demand for cement is not great and is confined principally to the larger cities and to the region adjacent to the coast. The building trades are in the hands of Indians or half breeds (Cholos) who are not progressive in the use of improved building materials. As the country is slowly becoming industrialized the outlook for future markets is more favorable.

In the early and middle twenties the Foundation Co. of New York constructed streets, sewerage systems, and waterworks in Bolivia and Peru and had, as one of its large projects, a sanitary works for the city of Oruro, Bolivia. As imported cement was costly, and conditions appeared favorable for an expanding cement market, leases were obtained on limestone deposits. At first it was planned to build a cement plant at Rosario near the Chilean border, but preference was given later to a higher-grade limestone near Copacabana on Lake Titicaca. The mill, however, was situated at Viacha about 30 kilometers from La Paz at the junction of three railroads. The operating company is the Sociedad Boliviana de Cemento of La Paz. According to Willimek[15] the company was organized in 1926 and production was begun in 1928. Initial capital was 120,000 bolivianos (about $45,000). The capital was subsequently increased to 1 million bolivianos, of which about 300,000 was local capital and the remainder was supplied by Peru and the United States. It is reported, however, that the Bolivian branch of the British firm Duncan, Fox & Co., La Paz, has invested in the Bolivian cement industry and is one of the agencies for marketing the product. Plant equipment was imported from the United States. Fuel oil is brought in over the Guaqui-La Paz Railway. An abundance of good clay is available near the mill. Originally the capacity of the plant was 50,000 barrels a year, and subsequently it was increased to 150,000 barrels.[16] The company was permitted to import oil and sacks duty free for 5 years but was required to give a 10-percent discount on Government orders.

With completion of the sanitary works at Oruro, marketing difficulties were encountered which were augmented by the depression, a decline in the price of tin (the principal source of income for Bolivia), and a continuation of the disastrous Chaco War with Paraguay. The Government and the railroads, the largest consumers of cement, can import their requirements duty free and with freight rebates. For other consumers the import duty is almost prohibitive - 1 boliviano per 100 kilos (about 62 cents a barrel) plus additional charges amounting to 130 percent. The imports, which originate in many countries, are principally for special uses. Low-price European cements, including considerable natural cement, are in greater demand than the better grades from the United States. Imports enter Bolivia by way of the ports of Mollendo, Peru, and Antofagasta and Arica, Chile. Prices of both domestic and imported cement are high.

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[15] Willimek, Rudolf, Der Stand der Zementindustrie in den Kordilleran Staaten: Zement, vol. 27, No. 9, Mar. 3, 1938, pp. 131-134.

[16] For a detailed description of the plant see Cement and Cement Manufacture, London, vol. 2, No. 4, April 1929, pp. 108-109.

The following table shows imports, production, and consumption during recent years.

Imports, production, and consumption of cement in Bolivia, 1935-38, in metric tons

Year	Imports from United States1/	Imports from Germany	Imports from United Kingdom	Total imports	Production	Consumption2/	Per-capita consumption, bbl. (376 lb.)
1935	115	49	67	1,177	40,212	41,389	0.07
1936	77	644	34	2,152	61,841	63,993	.12
1937	200	8,633	1,374	13,174	(3/)	(3/)	-
1938	30	(3/)	(3/)	(3/)	(3/)	(3/)	-

1/ Exports from the United States to Bolivia.
2/ Production plus imports.
3/ Data not available.

Brazil

Although several unsuccessful ventures are recorded in the early history of the cement industry in Brazil, in recent years greater success has been attained, and such rapid strides have been made that the country, except for certain outlying territories, is virtually self-sufficient.

Among the unsuccessful enterprises was a plant built in 1912 at Rodovalho, State of Sao Paulo, by the S. A. Fabrica Votorantim. It operated only a short time, and its failure is ascribed to poor management, an inferior product, and high fuel cost.

In 1917 an Italian company, Macchiorlatti & Cia, took steps toward building a cement plant at Bello Horizonte, Minas Geraes, but the venture apparently failed. Similarly a French company, Compagnie Franco-Bresilienne, was organized in Paris for the purpose of manufacturing cement in Brazil, but it also failed to materialize.

About 1924 German capital backed construction of a plant near Victoria, State of Espirito Santo. The plant failed because it was too small for economical operation.

In 1939 six cement plants were in operation in Brazil as follows:

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1. The oldest plant now operating was built in 1912 at Cachoeira de Itapemirim, near Victoria in the State of Espirito Santo. It was built by the State Government and was called "Fabrica de Cimento do Estado do Espirito Santo." It was an unsuccessful State enterprise, as the State never operated it. After 11 years of idleness the Governor was authorized in 1923 to lease it, but a lessee could not be found until 1935, when it was leased for 40 years to Barbara & Cia, Ltda. It is now operated by Sociedade Industrial de Cimento Monte Libano. It is a small plant, having a capacity of not more than 150,000 barrels a year, and produced less than 60,000 barrels in 1937. The product is sold under the brand name "Barbara."

2. As early as 1910 the limestones of the State of São Paulo had been investigated and favorable reports obtained. In 1923 they were investigated further by British and Canadian interests, and in 1924 the Companhia Brasileria de Cimento Portland S. A. was organized. The company was capitalized at 25,000,000 milreis ($1,250,000), of which 24 percent was held by Brazilians and 76 percent by the Canadian Foreign Investment Corporation. In 1929 a bond issue of $2,900,000 was authorized to redeem the mortgage of the Canadian syndicate and for additional plant construction. A new rotary kiln completed in 1930 is said to have increased the capacity of the plant from 100,000 to 170,000 tons annually. According to reports the plant is now controlled by British and Canadian capital.

Construction of the plant at Perús was begun in 1925 and completed in 1926. The principal raw material is pre-Cambrian limestone from Agua Fria. Considerable difficulty is experienced because of excessive magnesia in certain parts of the deposit. Clay is obtained at points 4 to 20 kilometers from the plant and gypsum for retarder, from the State of Rio Grande do Norte. It is a dry-process plant with a capacity of about 200,000 tons a year. Fuel oil is obtained in the United States or Mexico. The product is sold under the brand name "Cimento Perús."

3. After diligent search the Lone Star Cement Corporation of New York, N. Y., located a satisfactory limestone deposit at Sao Jose in the municipality of Guaxindiba, State of Rio de Janeiro. Construction of a plant was begun in November 1931, and production began in 1933. The operating company is known as Companhia Nacional de Cimento Portland. Owing to overcapacity of the plant owned by this company in Cuba, part of the equipment of the Cuban plant was dismantled and shipped to Brazil for use in the new plant at Guaxindiba.

The raw materials comprise high-calcium limestone and finely divided river mud brought in barges from the mouth of the Macacu River. It is a wet-process plant, and the slurry is fed to a 400-foot kiln fired with fuel oil. The plant is connected with the Leopoldina Railway by a 16-kilometer spur. Storage and distribution facilities are provided in Rio de Janeiro, the principal market.

Sanitation work on a dangerous malarial swamp near the plant site was prosecuted so vigorously by the company that the malaria hazard was eliminated.

This carefully planned and highly efficient plant has been described in detail in the technical press.[17]

The plant was enlarged in 1935 by addition of a second rotary kiln which doubled its previous capacity. Cottrell electrical dust precipitators were also installed. The plant is said to have a capacity of about 850 metric tons per day (about 5,000 barrels) or 300,000 tons per year. The brands sold are "Maua" (standard portland cement) and "Incor" (high-early-strength cement). The investment in this plant probably approximates $5,000,000.

4. The S. A. Fabrica Votorantim, with office in São Paulo, operates a plant at Votorantim, Sorocaba, State of São Paulo. It is capitalized at 20,000:000 milreis (about $1,000,000) with Brazilian capital. The equipment was obtained in Denmark. It has a capacity of about 160,000 metric tons a year, and the product is sold under the brand name "Votoran." Plans to double the plant's capacity were reported late in 1937.

5. The Companhia Parahyba de Cimento Portland, with office in Rio de Janeiro, constructed a small plant at Joao Pessoa, State of Parahyba, in 1935, employing German machinery. Authorized capital is 12,000 contos (about $600,000). The plant is operated by a holding company, Industrias Brazileiras Portella. The product has the brand name "Dolaport." The estimated capacity is 100,000 metric tons per year.

6. The Companhia Cimento Portland Itau, a Brazilian concern organized in 1937, built a cement plant employing Danish machinery at Itau on the southern border of the State of Minas Geraes. It began operation in December 1938 with a capacity of about 45,000 tons a year. The cement is sold under the brand name "Itau." The authorized capital is 7,000 contos (about $350,000).

The total annual capacity of these six plants is about 830,000 metric tons (4,900,000 barrels).

The establishment of additional plants is in prospect. In 1938 plans were in progress for the erection of a large plant at Ouro Preto, State of Minas Geraes, for production of high-alumina cement derived primarily from bauxite. More or less indefinite plans have been made to establish cement industries in the States of Bahia and Rio Grande do Sul.

The rapid development of the cement industry of Brazil has been promoted by governmental assistance and favorable natural conditions. Satisfactory raw materials are abundant in regions adjacent to manufacturing and population centers, and the wages of common labor are relatively low. Government assistance has been furnished in the form of decrees exempting cement manufacturers from Federal taxation for 10 years and from payment of import duties on machinery and equipment. The industry is also protected by an import duty on foreign cement amounting to about $5.72 a metric ton (nearly $1.00 a barrel).

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[17] Rock Products, Refinement in Design Feature of New Brazilian Cement Plant: Vol. 36, No. 10, Oct. 25, 1933, pp. 20-24.

Prior to 1926 all the cement required in the country was imported. Conditions have changed to such an extent that now imports (except of white cement) are virtually limited to those parts of Brazil that cannot be supplied profitably by domestic plants.

The following table shows imports and production over a period of years.

Imports, production, and consumption of cement in Brazil, 1919-38, in metric tons

Year	Imports from United States	Imports from Germany	Imports from United Kingdom	Total imports	Production	Consumption[1]	Per-capita consumption, bbl. (376 lb.)
1919	106,389	565	54,135	198,418	-	-	-
1920	76,129	13,826	47,794	172,992	-	-	-
1921	8,005	82,555	22,536	156,872	-	-	-
1922	26,342	100,637	39,814	319,550	-	-	-
1923	4,116	50,078	27,322	223,404	-	-	-
1924	1,848	81,779	47,464	317,152	-	-	-
1925	2,467	132,164	40,503	336,474	-	-	-
1926	2,154	127,146	36,541	396,322	13,382	409,704	-
1927	2,471	114,814	56,278	441,959	54,623	496,582	-
1928	3,999	103,961	60,837	456,212	87,964	544,176	-
1929	3,897	121,575	64,927	535,276	96,208	631,484	-
1930	2,591	73,185	45,507	384,503	87,160	471,663	-
1931	1,196	23,210	23,522	114,332	167,115	281,447	-
1932	991	13,383	46,875	160,534	149,455	309,989	-
1933	1,582	5,936	42,269	113,870	225,680	339,550	-
1934	2,264	11,978	42,047	125,702	323,911	449,613	0.06
1935	751	60,578	18,656	114,154	362,999	477,153	.07
1936	74	49,962	17,555	78,198	483,023	561,221	.08
1937	137	54,909	-	74,831	571,452	646,283	.09
1938	62	[2]36,000	-	[2]41,000	[2]650,000	691,000	.09

[1] Production plus imports.
[2] Estimated.

On a cost basis it is very difficult for United States cement to find a place in the Brazilian market. White cement, none of which is made in Brazil, is imported in considerable quantities - 17,500 to 20,000 barrels (150 kilos or 330 pounds each) per annum. The United States had a large part of this trade in past years, but with the introduction of "compensated" marks Germany recently supplied about 65 percent of the total, the United States 30 percent, and Great Britain 5 percent.

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About 90 percent of the portland cement sold in Brazil is used in the building trades and the balance for road making, bridge construction, and miscellaneous purposes. Hence the market fluctuates in consonance with activity in the construction industries. Cement sales increased progressively from 1925 through 1929 but declined greatly from 1930 to 1933. Since 1934 sales have increased rapidly and in 1938 surpassed those of any previous year. The demand is greatest in the large centers of population, such as Sao Paulo and Rio de Janeiro.

In 1938 domestic portland cement was quoted at milreis 10$200 to 11$300 (51 to 57 cents) per bag of 42 1/2 kilograms, f. o. b. customers' warehouses at Rio de Janeiro. Such prices are equivalent to $2.05 to $2.29 a barrel. In 1935 the comparable price was $1.92 a barrel. The recent increase is due mainly to an advance in tax rates. The consumption tax in 1938 was equivalent to 36 cents a barrel and the sales tax to 2.8 cents a barrel in United States currency.

Although it is estimated that existing plants could produce about 400,000 barrels per year in excess of the demands of the principal consuming areas, Brazil has no export trade. The inability of Brazil to compete in foreign markets is due partly to high freight rates. Brazilian coastwise shipping rates frequently are higher than those charged on cargoes from Europe to Brazil. A second factor is the high cost of fuel used in cement manufacture. Local coal is unfit for such use, and either coal or fuel oil must be imported.

Chile

The only producer of cement in Chile is Sociedad Fabrica de Cemento de El Melon, founded in 1906. According to Willimek,[18] the plant, which is near Calera, a town between Valparaiso and Santiago, had an initial capacity of 115,000 tons per year. Owing to lack of capital and foreign competition, the company operated on a small scale until the World War. After the war more favorable exchange rates and increased import duties permitted an expansion in capital and markets. In 1916 the capacity was increased to 175,000 tons a year. The original plant, the machinery for which was furnished by F. L. Smidth Co., of Copenhagen, was closed in 1930 and was replaced by a new dry-process unit of much larger capacity, the machinery for which was obtained in the United States. Owing to increasing markets a new kiln and enlarged clinker bins were added in 1935. The capacity of the plant was then 250,000 tons a year, and it was increased again in 1937 to 375,000 tons. Quick-setting and waterproof cements are made in addition to standard portland cement. Chilean coal is used for fuel. The reserve of high-grade raw materials is said to be adequate for 50 years' operation at the present rate of production. The limestone deposit that furnishes the principal raw material is one of the few commercial occurrences in Chile. The investment was said to be

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[18] Willimek, Rudolf, Die Entwicklung der chilenischen Zementindustrie: Zement, vol. 27, No. 3, Jan. 20, 1938, p. 43-44.

32,700,000 pesos ($3,949,670) in 1930 and 53,800,000 pesos ($2,756,712) in 1936. (In 1930, 1 peso was worth 12.079 U. S. cents; in 1936 only 5.124 U. S. cents.) It is reported that the Chilean Government owns about one-third of the capital stock. Most of the remainder is held by resident English or Anglo-Chileans. The company is well-established financially, and the plant has been notably profitable. According to report, profits from 1916 to 1923 averaged 21.3 percent, and in 1936 they were 17.6 percent.

Prices are governed largely by import duties, and although they are generally high it is claimed that further tariff protection is necessary. Sales prices vary with the distance from the plant. Reductions are made in the price of cement shipped to distant Provinces to acquire or retain markets that might otherwise be invaded by foreign cement. A recent increase in tariffs has favored competition with foreign products in northern and southern Chile.

The company has developed a laudable social program for the benefit of its employees. It has also offered a special 10-percent discount in the net price of cement to be used in the earthquake-stricken areas.

Various proposals have been considered for the establishment of additional plants in Chile. Limestone deposits on Hovadura Bay, 40 miles north of Antofagasta, and at Polpaico, 42 miles from Santiago, have been investigated by Chilean capitalists. A second company, Fabrica de Cemento El Romeral, was organized in 1936 with a capital of 28,500,000 pesos ($1,460,340), not all of which was paid, for the purpose of constructing a plant at El Romeral near Santiago. Although extensive limestone and clay deposits occur nearby and power is readily available, the prospect of building a new plant is regarded as doubtful.

Imports, which are relatively small, comprise principally white, special, and natural cements. They originate chiefly in Germany, the United States, and Great Britain. Ships embarking from Europe for nitrates or copper carry cement more or less as ballast. There is a small export trade to adjacent territories of Argentina and Bolivia.

The following table shows Chilean cement production, imports, exports, and apparent consumption during the past 10 years. The drastic decline in imports after 1930 was due primarily to a large increase in the import duty effective December 20, 1930.

Production, imports, exports, and apparent consumption of cement in Chile, 1929-38, in metric tons

Year	Imports from United States	Imports from United Kingdom	Imports from Germany	Total imports	Exports	Production	Consumption[1]	Per-capita consumptio bbl. (376 lb.)
1929	2,771	45,740	74,981	241,964	692	145,234	386,506	0.50
1930	1,354	72,919	67,395	252,073	254	161,743	413,562	.53
1931	52	14,725	12,587	30,526	87	102,310	132,749	.17
1932	41	1,869	7,005	11,068	1,792	112,441	121,717	.16
1933	202	21	44	974	3,033	139,058	136,999	.18
1934	350	146	102	854	3,875	203,416	200,395	.26
1935	821	385	839	17,018	880	284,885	301,023	.39
1936	624	303	775	1,710	1,193	248,424	248,941	.32
1937	807	318	688	1,828	1,316	313,110	313,622	.40
1938	879	466	294	1,676	101	363,987	365,562	.47

[1] Production plus imports minus exports.

Demands for cement in Chile were relatively small before 1934, but since then the country has been more prosperous and the construction of public buildings, highways, and railroads has consumed increasing quantities. Concrete roads have been built in and near various cities. A special highway fund of 250,000,000 pesos ($12,929,000) and a school construction fund of 210,000,000 pesos ($10,860,360) have been proposed in the Chilean Senate. Rehabilitation from the recent disastrous earthquake will necessitate use of large quantities of cement. A law enacted about 1929 required that all new buildings in Antofagasta have exterior walls of concrete to prevent damage from fires and earthquakes. New port and harbor works and the copper and nitrate industries will need considerable cement. The growth of the industry has brought about a corresponding increase in the number of workers employed (1,557 in 1938 compared with 1,398 in 1937 and 1,120 in 1935 and 1936).

Colombia

Colombia is well-supplied with raw materials and fuels for cement manufacture. The country is richly endowed with limestone, clay, and gypsum and has natural resources of both coal and petroleum. Its potentialities as a cement producer have been studied by British, Belgian, and United States interests.

Three cement plants now operate in Colombia as follows:

(1) Fabrica de Cemento Samper, with a paid-up capital of 2,830,000 pesos ($1,583,470), built a plant near Bogotá many years ago. Upper Cretaceous limestone, the principal raw material, is obtained at La Siberia, 43 kilometers from Bogotá. A cableway 9.5 kilometers long brings in coal and carries out cement. Machinery was supplied by the Polysius Co.

of Germany.[19] The plant has a capacity of 150 tons per day, but the output could be readily increased. The product is said to be somewhat below standard in grade because of inadequate chemical control of raw materials. The name of the company has recently been changed to Manufacturas de Cemento S. A.

(2) Compañia de Cemento Portland Diamante, Apulo, with a capital of 2,840,000 pesos ($1,589,065) operates a plant near Girardot, Province of Cundinamarca. Construction of the plant, for which equipment was supplied by F. L. Smidth & Co., of Copenhagen, was begun in 1927, and production began toward the end of 1930. The wet process is employed, and the cement is said to be of good quality. According to reports the plant capacity is 108,000 metric tons.

(3) Compañia de Cemento Argos, with a capital of 657,000 pesos ($367,611), was organized by Jorge Carrisquilla of Medellin, Province of Antioquia, and presumably the plant is near Medellin. Machinery was supplied by the Krupp Co. of Germany in return, so it is reported, for an interest in the company. The Antioquia Ry. and the Municipality of Medellin are large shareholders. No data are available on the size of the plant or on the raw materials used.

A new plant was under construction at Medellin in 1939. The operating company is Cia de Marmoles y Cementos del Nare, and the contract for construction is in the hands of Edgar Allen & Co., Ltd., Sheffield, England. The annual capacity of the plant will be 87,000 metric tons (513,000 barrels).

It was reported in July 1938 that Compañia de Cementos Portland Diamante was making plans for a new plant at Bogotá.

Domestic capital predominates in the Colombian cement industry. The companies operate independently and have no Government connections.

Cement imports reach Colombia chiefly through Tumacao and Buenaventura on the west coast and Cartegena, Barranquila, and Santa Marta on the east coast. Foreign cements are sold chiefly in the coastal regions and in the Cauca and Magdalena River Valleys.

Before 1908 Germany was the chief foreign source of supply, but the United States dominated the market from that year until 1923. Subsequent to 1923 Germany again took the lead, and the Scandinavian countries attained increasing importance. Danish cement is handled by the Vestindisk Handelskompagni.

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[19] Cemento, Madrid, La industria sud-Americana del cemento, Fabrica de Cemento Titán, de Colombia, vol. 7, No. 78, November 1935, pp. 369-371.

The import duty on cement is 0.01 centavo per kilo, or about 97 cents a barrel. Certain public works projects enjoy customs exemptions. No cement is exported.

The following table shows imports, production, and consumption during recent years.

Imports, production, and consumption of cement in Colombia, 1935-38, in metric tons

Year	Imports from United States[1]	Imports from Germany	Imports from Denmark	Total imports	Production	Consumption[2]	Per-capita consumption, bbl. (376 lb.)
1935	1,587	12,378	6,576	23,885	77,000	100,885	0.07
1936	1,681	26,053	18,276	53,066	104,465	157,531	.11
1937	2,017	16,079	2,472	39,881	123,175	163,056	.11
1938	3,497	(3/)	(3/)	52,884	144,000	196,884	.13

[1] Exports from the United States to Colombia.
[2] Production plus imports.
[3] Data not available.

Ecuador

Both limestone and gypsum are available for cement manufacture in Guayas Province. Ecuador has no coal but abundant supplies of oil.

During 1922 a dry-process cement plant was built at Estero Salado near Guayaquil, Guayas Province, on a property covering 7 1/2 square kilometers. The plant has easy access to the Guayaquil-Quito Ry. and to river transportation. Both domestic and German capital amounting to $75,000 was employed, and the machinery was furnished by the Krupp Co. of Germany. The raw materials are limestone and clay obtained near the plant. The original kiln was only 30 by 2 meters (approximately 100 by 6.7 feet) and had a daily capacity of 240 barrels. It was fired with crude petroleum. The product is said to have been of inferior quality, and according to Willimek[20] the plant was taken over in 1923 by a British-Canadian consortium, the Compañia Anonima de Industrias y Construcciones, Guayaquil.

In 1934 an American group interested in the commercial development of Ecuador acquired a 20-year lease on the plant. The new company, La Cemento Nacional C. A., is capitalized at 400,000 sucres ($36,628). Virtually all the equipment of the old plant was scrapped because of deterioration due to improper maintenance, and second-hand equipment was purchased in the United States. The remodeled plant produces about 250 barrels a day of cement said to be of good quality, which is sold under the brand name "Roca Fuerte."

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[20] Willimek, Rudolf, Der Stand der Zementindustrie in den Kordilleren-Staaten: Zement, vol. 27, No. 9, Mar. 3, 1938, pp. 131-134.

The company cannot supply the entire domestic demand, but foreign cement may be obtained at low prices. The requirements of the country in excess of that furnished by the domestic company enter free of import duties and landing charges. Climatic conditions are such that large stocks cannot be maintained because the cement deteriorates greatly in 3 or 4 months; it is imported in lots of 500 to 2,000 barrels, chiefly from England and Germany. British oil companies import British cement through their home offices. Small quantities are obtained from Chile, and white cement only is obtained from the United States. Imported cement is employed chiefly in public works, and minor quantities enter the general trade through the hands of distributors.

Statistics for Ecuador are too incomplete to tabulate. Imports from the United States have ranged from 85 to 301 metric tons per year since 1934. Total imports in 1933 were 11,045 metric tons, of which 5,855 came from Norway and 770 from Germany. Production in 1935 was 13,674 metric tons. Annual consumption is estimated at about 23,000 metric tons.

Paraguay

Steps were taken by a French company to establish a cement plant at Itapucumi in 1912, but the work was interrupted by the World War. In 1926 a local company repaired and completed the plant which has been in operation at intervals since that time. According to report[21] the company employed 200 men and made cement of good quality in 1931, but evidently the plant has been inactive during recent years. The capital of the company was 100,000 gold pesos ($92,150). Imports were 4,291 metric tons in 1935 and 4,863 in 1936. Later data are not available.

Peru

Peru has one cement plant. According to Willimek,[22] the machinery was obtained in the United States. The operating company, Compañia Peruana de Cemento Portland El Sol, organized in 1916, constructed a one-kiln plant with a capacity of only 125 barrels a day. Raw materials obtained near Lurin were brought to the plant at Lima over a 25-kilometer railway.

A second small plant at Lima, which used raw materials from the same locality, was operated a short time during this early period by Peruvian Sr. Nicanor Garcia y Lastres. It is said to have had a capacity of only 1,500 barrels a month.

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[21] Pan American Union Bull., Paraguay. Manufacture of Cement: Vol. 65, No. 8, August 1931, p. 871.

[22] Willimek, Rudolf, Der Stand der Zementindustrie in den Kordilleren-Staaten: Zement, vol. 27, No. 9, Mar. 3, 1938, pp. 131-134.

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Operation of the El Sol company was interrupted because of mechanical difficulties, and it produced only 2,500 tons per year. It was reorganized under the name Compañia Peruana de Cemento Portland, and its capacity was enlarged to 45,000 tons a year. In 1923 operations were entrusted to an American construction concern, the Foundation Co. of New York, N. Y., but it is claimed that a majority of the shareholders were Peruvians, and its name was not changed. Even under the new management the plant was unable to make a satisfactory product, and in 1924 replacement of the old equipment with that of new and modern design was begun. The new dry-process plant using Peruvian fuel oil began production in August 1925 and has been notably successful and profitable to its owners since that time. However, the poor reputation of the early product was a handicap that required years to overcome.

According to Blaise[23] the plant had two 8- by 125-foot kilns in 1929. It is said to have furnished half the national requirements in 1927 and two-thirds in 1931-32. A cement shortage in 1936 caused suspension of many private construction jobs. To meet the growing demand, the company added another kiln late in 1936 and a fourth kiln in 1938. Present plant capacity is said to be 120,000 tons per year. In 1936 the capital of the company was increased from S/5,000,000 to S/6,825,000 ($1,244,000 to $1,697,000).

The rock used is an argillaceous limestone (cement rock) requiring only the addition of small quantities, seldom exceeding 6 percent, of sand. It is fortunate that the rock contains the necessary argillaceous materials, because in the desert country near Lima clay deposits are unknown. The stone is crushed to 1 1/4-inch size at the quarry and conveyed to the plant by railroad. Plans have been made to move the cement mill to Lurin where the quarries are situated. Virtually all the quarry and mill equipment is of United States manufacture. Climatic conditions are favorable. The climate is similar to that of Southern California except for the fact that there is no rain.

Several attempts have been made to establish additional cement plants in Peru. In 1927 a British mercantile firm and a Peruvian group proposed to build a plant on a harbor a little south of Lima at a cost of £300,000. German, Swiss, and Danish firms have investigated and in some instances reported favorably upon cement projects. Some of the reports were made for the Krupp Co. and the Polysius Co. of Germany. Although none of these projects materialized, rumors of possible competition induced a downward trend in cement prices.

The price of cement at the local plant at Lima in 1937 was the equivalent of $2.12 a barrel in United States currency. German cement was quoted at $1.83 a barrel, c. i. f. Callao, and Japanese cement at

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[23] Blaise, P. C., Peruvian Cement Co.'s Cement Mill at Lima, Peru: Rock Products, vol. 32, No. 21, Oct. 12, 1929, pp. 59-65.

$2.00 a barrel. However, to these prices must be added an import duty, customs, surtaxes, an unemployment tax, and landing charges amounting in all to about $1.25 a barrel, which make it difficult for foreign cement to compete with domestic in the Lima-Callao and Central Peru districts. Conversely high transportation costs discourage competition of domestic with foreign cements outside this region. When cement is imported by the Government or for the use of public institutions, the import duty is remitted.

Imports through Talara are for a Canadian oil company, and those through Salaverry are chiefly for an American mining company. Imports through the port of Mollendo best indicate the general market for foreign cement. Imports of white and other special cements amounted to 2,034 barrels in 1934, 2,965 in 1935, and 50,504 in 1936. Stucco is very popular in Peru, and this chiefly explains the imports of white cement, considerable quantities of which originate in the United States.

Peru has experienced a more rapid recovery from the depression than the neighboring countries. Conditions in building, mining, and other industrial activities have improved steadily since 1934. The Government's Three-Year Plan for improving transportation facilities will involve large expenditures for highways, and irrigation works are under construction to overcome the generally arid condition of the country. New harbors are being built on the south coast, and an enlargement of Callao Harbor is in prospect. For these reasons a substantial increase is forecast in the market for cement.

The following table shows recent imports, production, and consumption.

Imports, production, and consumption of cement in Peru, 1934-38, in metric tons

Year	Imports from United States[1]	Imports from Germany	Imports from Japan	Total imports	Production	Consumption[2]	Per-capita consumption, bbl. (376 lb.)
1934	193	-	-	15,140	45,576	60,716	0.06
1935	363	-	-	28,067	60,296	88,363	.08
1936	342	24,709	9,196	45,756	75,115	120,871	.11
1937	426	39,084	11,487	54,724	83,048	137,772	.13
1938	623	18,735	18,561	41,498	101,707	143,205	.13

1/ Exports from the United States to Peru.
2/ Production plus imports.

Uruguay

During 1911 and 1912 the German firm, Miag, built a one-kiln wet-process cement plant at Sayago, 7 kilometers from Montevideo. A second kiln added in 1914 increased the capacity of the plant to about 45,000 metric tons (265,000 barrels). In July 1919 the Lone Star Cement Corporation

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of New York, N. Y. (International Cement Corporation), purchased the plant, and it has since operated under the name "Compañia Uruguaya de Cemento." In 1929 the company added four cement storage silos each 32 feet in diameter and 80 feet high. Their combined capacity is said to be 100,000 barrels. In 1930 four kilns were operated, and the plant had an annual capacity of about 200,000 metric tons (1,180,000 barrels). Originally coal was used for fuel, but later the plant was modified to use oil which is imported from Colombia, Venezuela, or Mexico. The company is capitalized at 5,000,000 pesos (about $2,500,000) and employs 500 to 600 men.

Limestone, which is used as the principal raw material, is quarried at Minas, about 125 kilometers distant, and transported to the plant by rail. The deposit is said to be extensive. Clay is obtained near the mill, and gypsum is imported. Burlap imported from India is made into bags of 50 kilos capacity at the plant. Production costs are high because fuel and raw materials must be conveyed so far. The cements sold as Artigas and Incor brands compare favorably in quality with imported products.

The Compañia de Materiales de Construcción, manufacturers of refractory brick, stone, and other products, began construction of a cement plant in 1937. During the spring of 1939 this company seems to have been renamed the Compañia Nacional Cemento, with offices in Montevideo. The company is capitalized at 2,500,000 pesos ($1,976,000) and is backed by the Uruguayan Banco Frances Supervielle & Cia. The plant is at Nueva-Cararra, 110 kilometers east of Montevideo. The wet-process plant, for which Denmark supplied the machinery is said to be capable of producing 40,000 tons of cement annually. Both gray and white cement will be made, as well as supercement and lime. The plant is reported to have commenced production in July 1939.

Cement plants in Uruguay have certain monopoly privileges under the provisions of the Uruguayan law regarding the establishment of new industries in the country. The resulting high cost of cement stimulated a demand for a Government-operated plant to supply cement for Government use. In 1928 a Government cement plant was proposed under a 4,000,000-peso ($2,574,800) bond issue, but the proposal was vetoed by the President and could not be passed over his veto.

A law dated October 10, 1931, charged the State monopoly company, Administracion Nacional de Combustibles Alcohol y Portland, popularly known as "ANCAP", with the manufacture of cement.[24] A decree established March 5, 1937, requires not only that the ANCAP shall control the prices of portland cement destined for public works, with authority to import, but also that all cement used in public works shall be acquired directly from the ANCAP except when the ANCAP is unable to supply it. Evidently this decree will not be in force until such time as the Government plant is in operation.

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[24] Willimek, Rudolf, Die Zementindustrie Uruguays: Zement, vol. 28, No. 4, Jan. 26, 1939, pp. 57-58.
Griebner, G., Ausschreibung für den Bau einer staatlichen Zementfabrik in Uruguay: Zement, vol. 27, No. 34, Aug. 25, 1938, p. 522.

On November 8, 1938, the ANCAP announced a public subscription to build and equip a cement plant at Montevideo. The initial capacity of the projected plant is 50,000 tons (nearly 300,000 barrels) a year, and it is intimated that later the capacity will be doubled. Limestone will be obtained from Minas, 120 kilometers from Montevideo, clay from the Rio Plata River, and fuel oil from the refinery operated by the ANCAP. The ANCAP has awarded a 5,000-peso ($3,219) scholarship to a young engineer who will first make a personal study of German and United States cement plants.

The operation of a Government-owned plant has the backing also of Centro de Barraqueros de Materiales de Construccion, an association of contractors representing 23 firms. The construction interests also seek lower tariffs to encourage larger imports of foreign cement. A reduction in tariffs is opposed by the operating companies, but they would be agreeable to such change if there was a corresponding reduction in electric-power costs. The local cement industry is the largest consumer of electric power, using about 10 percent of the Montevideo output.

According to figures compiled by the Bureau of Foreign and Domestic Commerce, production in 1932 was 779,748 barrels; in 1933, 778,049 barrels; and in 1934, 617,258 barrels. Figures for later years are given in the table that follows. About one-half the cement sold in 1932 and 1933 was used in Government projects, but in 1935 less than 20 percent was so used.

The protective tariff is high (0.015 peso per kilo or about $1.28 per barrel), and imports, which are relatively small, consist chiefly of white and other special cements. They enter through Montevideo and are shipped over Uruguay by rail or in small river boats. Railway freight rates are high.

Cement is used extensively in Uruguay, where the per-capita consumption is the highest of any country in South America except Argentina. Nearly all the roads, which are said to be the best in South America, are of concrete.

The following table shows imports, production, and consumption during recent years.

Imports, production, and consumption of cement in Uruguay, 1935-38, in metric tons

Year	Imports from United States[1]	Imports from Belgium	Imports from Germany	Total imports	Production	Consumption[2]	Per-capita consumption, bbl. (376 lb.)
1935	893	245	122	3,540	99,778	103,318	0.29
1936	640	794	97	2,059	111,073	113,132	.32
1937	847	7,847	7,810	18,824	147,773	166,597	.47
1938	320	(3/)	(3/)	(3/)	(3/)	(3/)	-

1/ Exports from the United States to Uruguay.
2/ Production plus imports.
3/ Data not available.

Venezuela

Most of the limestone deposits of Venezuela are low grade. Shell accumulations, although satisfactory for cement manufacture, are of small extent. The country has no commercial occurrences of gypsum, but fuel oil is available.

According to Willimek,[25] Compañia Anónima Fábrica Nacional de Cemento operates Venezuela's single cement plant at La Vega, a suburb of Caracas. It was built in 1907 and was said to have a capacity of 150 barrels a day, which was increased to 300 barrels a day in 1920. Operation has been profitable as the protective tariff is high. Originally the tariff was 0.055 bolivar per kilo, equivalent to $2.92 per barrel, but in August 1938 it was reduced to 0.02 bolivar per kilo ($1.02 per barrel). According to the Bureau of Foreign and Domestic Commerce,[26] this plant supplied less than half the Nation's requirements in 1934. During 1938 the company purchased machinery in Europe to increase the plant capacity. It is planned eventually to increase the capacity to 400 to 500 tons per day. The company is now capitalized at 3,000,000 bolivars ($930,000). The product, sold under the brand name "Cemento Nacional," at times lacks uniformity and is said to be slow setting.

The need of a larger domestic supply has led to proposals to build two new plants. Banco Industrial de Venezuela, Caracas, was organized in 1937 to erect a plant at San Cristobal costing between 3,000,000 and 4,000,000 bolivars ($930,000 and $1,240,000). The proposed capacity of the plant was 100 metric tons a day, and construction was to begin during 1939.

A second new plant with a capacity of 200 metric tons a day probably will be erected shortly by Compañia Anónima de Cemento Taos. Originally

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25/ Willimek, Rudolf, Der Stand der Zementindustrie in den Kordilleren-Staaten: Zement, vol. 27, No. 9, Mar. 3, 1938, pp. 131-134.
26/ Foreign Trade Notes, Jan. 5, 1936.

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it was planned to erect the plant at Maracaibo, but later the Island of Taos in the State of Zulia was chosen. The island is said to have low transportation charges to the mainland and raw materials of first quality. It also has the prospect of developing an export trade. On June 20, 1938, the Ministry de Fomento placed 2,000,000 bolivars ($620,000) to the credit of the company in the Banco Industrial de Venezuela. Half of this amount was a loan to the company, and the other half was money for the purchase of capital stock. The combined capacity of the two proposed plants will be about 90,000 metric tons (530,000 barrels) per year.

The principal consumers of cement in Venezuela are the oil companies and the Government. It is customary for the oil companies controlled by European capital to buy their cement in Europe and for those controlled by American capital to buy it in the United States.

The following table shows salient statistics of the cement industry of Venezuela insofar as data are available. Venezuelan import statistics have been disregarded, as evidently they cover only a fraction of the total.

Imports, production and consumption of cement in Venezuela, 1935-38, in metric tons

Year	Imports 1/ from United States	Imports 2/ from Germany	Imports 3/ from Denmark	Total 4/ imports	Production	Consumption 5/	Per-capita consumption, bbl. (376 lb.)
1935	13,101	32,774	1,695	46,500	21,811	68,311	.12
1936	10,379	46,621	6,431	67,200	37,583	104,783	.18
1937	19,755	61,590	13,269	119,500	44,626	164,126	.28
1938	37,000	47,435	(6/)	113,000	39,863	152,863	.26

1/ Exports from the United States to Venezuela.
2/ Exports from Germany to Venezuela.
3/ Exports from Denmark to Venezuela.
4/ Approximate figures.
5/ Production plus imports.
6/ Data not available.

CENTRAL AMERICA

British Honduras

The demand for cement in British Honduras is quite limited, and the country has no cement-producing industry. In line with Empire preferential policy most imports originate in the United Kingdom and Canada. Imports from the United States have averaged about 200 metric tons a year for the 4-year period 1935-38.

Costa Rica

Limestone, chalk, and clay are available as raw materials for cement manufacture in Costa Rica, but fuel would have to be imported as domestic coal is of low grade. Gypsum likewise must be obtained from foreign sources. The country has no cement-producing industry. Although cement consumption in Costa Rica is too limited to warrant the operation of even a small plant, steps have been taken at various times to establish such an industry. Plans were made in 1920 and again in 1923, but they were fruitless. In 1934 an effort was made to interest United States capital in a project that would utilize limestone deposits near Cartago, and in 1938 there were rumors of a projected cement plant at San Jose.

Imports enter the country by way of Limon on the Atlantic coast, and Puntarenas on the Pacific. Imports in 1938 totaled about 110,000 barrels, of which Germany supplied 70, Norway 23, Italy 2, and the United States 1 percent. In 1937 the imports were about 137,000 barrels, of which 88 percent originated in Germany, 5 percent in Italy, and only a fraction of 1 percent in the United States. Swedish and Japanese cement is also imported. Because of enlarged Government demands the requirements will be much greater in 1939 than in 1938. Although there are no import duties a customs surcharge of 100 percent is levied on products from countries with which Costa Rica's trade balance is unfavorable by more than 50 percent. There are also certain wharfage fees which are doubled on cement imported from Japan.

Small tonnages of white cement are imported. In 1938 they originated chiefly in Germany, Italy, and the United States in the order named.

Guatemala

Limestone and clay are abundant in Guatemala. Gypsum for retarder may also be obtained from domestic sources, but the deposits near Chiquimula are so inaccessible that the gypsum is said to cost $50 a ton delivered.[27] Oil for fuel must be imported.

At one time cement clinker was imported from the United States and ground in Guatemala, but in 1897 a dry-process cement plant was built about 2 1/2 kilometers from Guatemala City. The two rotary kilns are of United States manufacture. It is reported that in 1917 the company was capitalized at $250,000 and that the plant had a capacity of 40,000 barrels a year and employed 200 men. The operating company, La Fabrica Nacional de Cemento de los Señores Novella & Compañia, has had considerable financial trouble and has been reorganized several times. The International Railways of Central America invested heavily in the company before 1927. In 1928 the Government granted a 10-year exemption from customs charges, except consular fees, on all imported materials required for the manufacture of cement up to 100,000 barrels a year. The exemption applied to firebrick, coal, oil, sacks, gypsum, and explosives used in quarrying. In 1939 the exemption on petroleum and explosives was renewed for 2 years, and in return the company was to furnish the Government with 200 barrels of cement per year free of charge. Furthermore, sales to the Government were subject to a 20-percent reduction in price when the cement was to be used for public works and a 10-percent reduction when it was to be used for other purposes.

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[27] Ingenieria Nacional (Guatemala), Visita de la Asociación de Ingenieros de Guatemala a la Fabrica Nacional de Cemento, de los Señores Novella & Compañia:. Vol. 1, No. 19, Aug. 31, 1933, pp. 313-319.

It is reported that the plant was enlarged in 1933 to a capacity of 150,000 barrels a year and that between 1935 and 1937 new machinery of German origin was installed and the mill renovated. Standard portland cement, crushed stone, and lime are sold. The plant is large enough to supply the entire demands of the country, which have increased steadily since the disastrous earthquakes of 1917. Market demands depend principally on the state of the building trades, which in turn is influenced by the prosperity of the coffee industry. Proposed paving, sewerage, and Pacific coast harbor projects promise to increase markets.

Imports, chiefly white cement, originate principally in Germany, Italy, Belgium, and Sweden. Imports from the United States for the past 10 years have been less than 2,000 barrels a year except in 1937 when they reached 5,028 barrels, but they dropped to only 142 in 1938. The import duty is 1 cent per gross kilo ($1.71 per barrel) plus 3 percent consular fee on the invoice. Imported cement competes with the domestic, principally in the Pacific and Caribbean Sea coastal districts. To prevent wetting, particularly in the open harbors of the southern coast, most of the cement is imported in barrels.

Honduras

Limestone and clay evidently are available in Honduras, but gypsum and suitable fuel are lacking. A concession was granted for establishment of a cement plant in 1935, but the plant did not materialize. In April 1939 a concession was granted to a nephew of the President and a son of the Minister of Education to establish a plant near Tegucigalpa.

Imports in 1937 totaled about 25,400 barrels; the United States supplied between 9,000 and 10,000 barrels and Germany about 7,700 barrels. Between 1932 and 1936 exports from the United States to Honduras ranged from 18,000 to more than 47,000 barrels a year. About four-fifths of the imports enter on the northern or Caribbean Sea coast, and about one-fifth (chiefly German and Belgian) reaches the country from the southern coast. The United Fruit Co. is a large importer. Cement enters the country duty free.

Nicaragua

About 1930, small-scale production of cement was attempted by a gold-mining company in the Corinto district, but it proved to be uneconomical and the project was abandoned. Some years ago rumors were heard of a plant to be constructed at Managua, and recently plans have been made to build a plant in the mountains near Jinotepe southeast of Managua. The projected wet-process plant will have a capacity of 60 metric tons a day and will use charcoal for fuel. Vertical kilns or ovens of European manufacture are to be used in place of rotary kilns.

The tariff is equivalent to 9 cents in United States currency per quintal (100 kilos), or about 15 cents a barrel, plus a surtax of 25 percent of the duty assessed. Imports originate chiefly in Germany, but other European countries and the United States also furnish substantial quantities. German and Swedish ships coming to Nicaragua for coffee bring cargoes of cement at very low rates. Since 1930 imports from the United States have ranged from 398 to 3,318 barrels per year. About 90 percent of the imports are received through the port of Corinto, where there are additional charges of $1.60 a ton wharfage and $3.20 a ton for customs handling, brokerage, and clearance. When freight and dealers' profits are added the retail price ranges from $5.00 to $5.50 a barrel. Small quantities, approximately 1,000 barrels a year, enter the country through Bluefields on the eastern coast.

The principal importers are the railroad, paving contractors, the Government, and one large sugar estate.

Houses are built chiefly of wood, roads are poor, and the purchasing power of the people is low. Accordingly no substantial increase in the market demands is to be expected.

Panama

Limestone and clay occur in Cocle and Veraguas Provinces, but fuel and gypsum are lacking. No plans have been reported for establishing a domestic cement industry in Panama. Imports during recent years (exclusive of the Panama Canal Zone) range from 45,000 to 150,000 barrels a year. They originate chiefly in Norway, Sweden, and Germany. The United States is at a disadvantage because freight rates on cement from northern European ports are 50 to 60 percent lower than from United States or Cuban ports. Furthermore, as cash is not available when pearl shells and coffee are shipped to Germany, cement is taken in exchange for the Panama products. If the price differential were not so great, United States cements would be preferred because they can be delivered in less time. An order issued in May 1937 requires that cement containers be marked to designate the country of origin. Trade statistics show that prices of imported cement have declined considerably since 1928.28/

The import duty on cement, as established March 30, 1933, is 15 cents per quintal or about 26 cents per barrel. It is reported that a series of tourist hotels are to be built and that cement for their construction will enter duty free.

28/ Zement, Zementbedarf in Panama: Vol. 26, No. 47, Nov. 25, 1937, p. 770.

Panama Canal Zone

Raw materials for cement manufacture are available in the Canal Zone, but lack of fuel has discouraged establishment of a local manufacturing industry. Any movement toward construction of a plant in this area would be opposed by United States cement manufacturers. United States mills furnished large quantities of cement for building the canal structures, and subsequent needs have also been supplied by this country. Imports from the United States since 1930 have ranged from 67,000 to 466,000 tons a year. A small proportion of these shipments may reach points in Panama outside the Canal Zone.

Salvador

Limestone deposits are available in the Departments of San Vicente, Cabanas, Chaltenango, and Santa Ana, but the country has no fuel resources and no domestic cement industry. Clay and limestone found in the extreme northwest of the Metapan area have been tested, and they have proved satisfactory for cement manufacture.[29] Cement could be made by mixing lime with volcanic ash (puzzolana), of which there is an abundant supply, but lime burning would also require importation of fuel.

Imports average about 100,000 barrels a year, of which the Government uses about one-fourth. A small percentage of the imports originates in the United States.

Germany is the principal source of imports, which naturally arrive during the heavy coffee-shipping season. United States exports of cement to Salvador since 1930 have been very small, the maximum reaching 638 barrels in 1936. The Government is one of the largest purchasers, and the cement is used principally in street paving and highway construction.

The following table shows imports, production, and consumption of cement in Central America insofar as statistics are available. Of the imports from the United States, 80 to 90 percent are received in the Panama Canal Zone. Figures for imports are approximate only, because some countries compile returns on a fiscal-year rather than a calendar-year basis.

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[29] Choussy, Félix, La Industria del Cemento en El Salvador: Revista Agricola Salvadoreña (San Salvador), November 1912, pp. 6-8.

Imports, production, and consumption of cement in Central America, 1935-37, in metric tons

Year	Imports from United States[1]	Total imports	Production	Consumption[2]	Per-capita consumption, bbl. (376 lb.)
1935	26,225	64,897	(3/)	---	---
1936	21,553	74,266	(3/)	---	---
1937	18,295	88,660	4/27,000	115,660	0.09

1/ Exports from the United States to Central America.
2/ Production plus imports.
3/ Data not available.
4/ Estimated.

WEST INDIES

Cuba

Limestone, clay, and gypsum, the raw materials necessary for cement manufacture, are abundant in Cuba.

Cement was first manufactured in Cuba by a French company in 1898. The plant, which was constructed near Habana, had a capacity of 48,000 metric tons (about 280,000 barrels) of cement a year.[30] The product, sold under the brand name "Volcán", was inferior to imported cement, and the plant was abandoned in 1921.

In 1912 or 1913 the Krupp Co. of Germany built a cement plant near Guantanamo, Oriente Province, at the opposite end of the island from the center of the present Cuban cement industry. The plant, owned by Cubans, was named "La Gloria." Evidently the equipment and methods were inadequate to make cement that could compete with the imported product, and after 1 1/2 or 2 years of operation it was closed permanently.

The single cement plant now operating in Cuba was built by the International Cement Corporation (Lone Star Cement Corporation), of New York, N. Y., but is operated by the Cuban Portland Cement Co. (Cia Cubana de Cemento Portland) with office in Habana. It was begun in 1916, but owing to the World War it did not produce until 1918. It is at Mariel, Pinar del Rio Province, about 30 kilometers from Habana, an admirable location both as to raw materials and transportation.

Limestone, the supply of which is virtually inexhaustible, occurs on a hill adjacent to the plant, and clay is available on the same hill. The property comprises 1,350 acres. Gypsum for retarder is obtained from a deposit in Matanzas Province. It is conveyed 1 1/2 miles by aerial tramway to the railroad, by means of which it is transported to the cement plant about 70 miles away.

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[30] Sociedad Cubana Ingenieros, Revista, La industria del cemento en Cuba: Vol. 4, March 1912, pp. 85-86.

The plant was originally designed as a dry-process plant and was equipped with two kilns using coal for fuel. Later it was changed into a wet-process plant, and petroleum was substituted for coal. Mexican or Venezuelan crude oil is brought in by tankers. Owing to the low prices of sugar, one of the principal sources of Cuban income, the market for cement expanded little for several years. In 1924 a third kiln was constructed, and from 1925 to 1928 three additional kilns were built, making a total of six. The machinery for the plant was purchased in the United States. The increased capacity was required to meet the demands of a great public improvement program, which involved an outlay of $120,000,000 and included the famous Central Highway 705 miles long and 20.66 feet wide. From 1928 to 1930 the plant worked virtually at capacity, producing about 350,000 metric tons annually and employing about 300 men. The company has established a safety organization which is so efficient that the plant has attained a remarkably low accident rate on the basis of man-hours of employment, even during the years of maximum production.

The depression years hit Cuba with particular intensity, and as the public works program also subsided cement sales declined greatly. A normal market of 1,000,000 barrels annually had dropped to 220,000 barrels by 1933. As the capacity of the plant was far beyond market requirements two kilns were dismantled and shipped to a new plant being built by the same company in Brazil. The remaining four kilns appear to be adequate for all reasonable demands, even if imports should be greatly reduced.

In 1924 a warehouse with a capacity of 6,000 metric tons was built in Habana. Two steel barges holding 765 and 835 metric tons, respectively, transport the cement. The barges require 7 to 8 hours for loading and unloading and 4 to 5 hours to make the trip. In 1929 Compañia Cubana de Cemento Portland built a packing plant at Nuevitas, Camaguey Province, on the north coast some 475 kilometers from Habana where the important sugar industry consumes large quantities of cement. This packing house also supplies the needs of the entire eastern end of the island formerly supplied by imported cement. It has a capacity of 17,000 metric tons and is served by a motor barge of 1,000 tons capacity. All three company barges are equipped with Fuller-Kinyon pumps for unloading. The cement industry of Cuba has been described in some detail in the technical press.[31]

Between 1926 and 1930 steps were taken to establish a second cement plant in Cuba. Options were taken on land in 1926, and in 1929 the Atlas Portland Cement Co. purchased land on Habana Harbor. Plans were made to erect a plant, but the collapse of the cement market shortly thereafter discouraged the enterprise.

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[31] Rock Products, The Cement Industry of Cuba: Vol. 34, No. 25, Dec. 5, 1931, pp. 25-31.

In 1936 Cuban cement was quoted at $2.75 a barrel, a price that had been in effect many months.

Cuban requirements are supplied partly by imports. Belgium has been the leading source of supply for gray cement and the United States for white cement. Germany also has furnished considerable gray cement and France white cement. Manufacturers in the United States can scarcely compete with the low-priced products offered by Belgium and Germany. Standard cement is imported in cotton or paper bags and white cement in barrels. White cement is imported in small quantities, chiefly for the manufacture of floor tile. A low-priced, slow-setting, French white cement is used to some extent. The domestic industry is fostered by substantial freight rebates allowed by the Cuban R.R. This freight differential virtually excludes foreign cement from points 40 miles or more inland from ports of entry. Cuba maintains a small export trade in cement with the Antilles countries.

Puerto Rico

Although a United States possession, Puerto Rico is an integral part of the West Indies. Raw materials for cement manufacture are abundant. A large part of the island consists of high-grade coral limestone intruded by various volcanic rocks, some of which are decomposed into high-silica and low-silica clays. In 1936 construction of a cement mill was undertaken by the Puerto Rico Reconstruction Administration under the direction of the United States Department of the Interior. The site selected was Catano near San Juan, as about 70 percent of the cement market is centered in this area. United States machinery was used throughout, and the mill is modern in every respect. The plant has one kiln 306 feet in length and 7 feet 6 inches in diameter, with an enlarged burning zone of 8 feet 6 inches. It is a wet-process plant with a capacity of 350,000 barrels per year. Its total cost, approximately $1,400,000, is relatively high, partly because it is constructed to resist hurricanes up to 150 miles per hour. The raw materials are limestone and clay, and oil is used for fuel. Gypsum for retarder is obtained in Nova Scotia, Canada. Operation by the Insular Government of Puerto Rico was begun in January 1939, with a production of about 1,000 barrels a day. Late in 1939 steps were taken toward obtaining a loan of $700,000 to increase the capacity of the plant, as it was claimed that market demands of the island justify a greater output.

The plant has been described by Lauer[32] and Rylander.[33]

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[32] Lauer, Herbert H., United States Makes Portland Cement: Rock Products, vol. 41, No. 6, June 1938, pp. 34-38, 51.

[33] Rylander, Paul N., Puerto Rico's New Cement Plant: Pit and Quarry, vol. 31, No. 1, July 1938, pp. 35-41, 84-87.

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Jamaica

Jamaica has no cement plant but has an abundance of limestone and clay suitable for its manufacture. A small plant would supply the needs of the island, which amount to about 120,000 barrels per year. It was estimated in 1931[34] that cement could be made for 6 shillings a barrel, whereas imported cement now costs 10 shillings a barrel in Kingston. In 1931 experts employed by the Government of Jamaica recommended construction at Port Henderson near Kingston of a wet-process plant with a capacity of 30,000 tons a year. The fuel problem was not settled, and no further steps were taken.

Before 1920 the United States furnished about 90 percent of the island's requirements, but thereafter sales declined rapidly. By 1930, 77 percent of the imports originated in the United Kingdom, which is favored by a preferential tariff. The ability of American manufacturers to reenter the market will depend largely on rates of exchange.

About 85 percent of the cement used is ordinary portland cement, 10 percent quick-hardening and other special cements, and about 5 percent white cement.

Other West Indian Islands

There are no cement plants in the West Indies, except in Cuba and Puerto Rico. The small market of the Bahamas belongs to the United States. Because of a preferential tariff, British cement has displaced Canadian cement in Barbados.

The Dominican Republic has abundant supplies of limestone, gypsum, and clay but no coal or oil. Imports are duty free and are marketed chiefly in areas adjacent to Santo Domingo, San Pedro de Macoris, and Puerto Plata. Little cement is used in the interior. Immediately after the hurricane of September 1930 a measure enacted to forestall the use of inferior building materials required that no cement could be imported until tested by the British firm, R. W. Hunt, and approved according to the standards of the American Society for Testing Materials. American manufacturers were at a disadvantage as samples had to be sent to England for testing. Later amendments modified this requirement.

Haiti has an abundance of cement raw materials but no fuels. Market demands are small, the Haitian Government being the largest importer. Since 1930 the United States has lost most of this small market to Germany and Belgium. The import duty is $0.004 per gross kilo, which is equivalent to 68 cents a barrel.

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[34] Cement, Lime & Gravel (London), Jamaica Buys Danish Cement: Vol. 5, No. 11, September 1931, p. 332.

Trinidad and Tobago have deposits of shell limestone, and fuel oil is readily available, but the demands for cement are too small to justify establishment of a plant.

The following table shows imports, production, and consumption of cement in the West Indies insofar as data are available.

Imports, production, and consumption of cement in the West Indies (including Puerto Rico), 1935-38, in metric tons

Year	Imports from United States1/	Imports from United Kingdom	Imports from Germany	Production	Consumption	Per-capita consumption, bbl. (376 lb.)
1935	34,129	42,523	37,551	(3/)	2/244,000	0.11
1936	32,168	46,964	48,955	(3/)	2/285,000	.13
1937	63,407	63,282	46,075	(3/)	2/351,000	.16
1938	72,813	2/65,000	2/25,000	(3/)	2/290,000	.13

1/ Exports from the United States to the West Indies.
2/ Approximate figures.
3/ Bureau of Mines not at liberty to publish.

More than 90 percent of imports into the West Indies from the United States entered Puerto Rican markets, but as a new cement plant began operation on the island in 1939, overseas trade probably will be greatly reduced in the future.